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## REVIEW

# Nutrition in the first 1000 days and respiratory health: A descriptive review of the last five years' literature



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## KEYWORDS

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Respiratory health;  
Respiratory disease

**Abstract** The aim of this paper is to discuss the current evidence regarding short and long-term health respiratory effects of nutrients and dietary patterns during the first 1000 days from conception. Population of interest included children from birth to two years and their mothers (during pregnancy and lactation). Studies were searched on MEDLINE® and Cochrane database, inserting individually and using the Boolean ANDs and ORs, 'nutrients', 'micronutrients', 'LC-PUFA', 'Mediterranean Diet', 'human milk', 'complementary food', 'pregnancy', 'respiratory disease', 'pulmonary disease', 'asthma', 'epigenetics', 'first 1000 days', 'maternal diet' and 'respiratory health'. All sources were retrieved between 01-09-2015 and 07-12-2016. While unhealthy maternal dietary patterns (high fat intake) during pregnancy can result in alteration of foetal lung development, with increased risk of respiratory disorders, Mediterranean diet has been associated with a lower risk of allergic sensitisation and allergic rhinitis. Breastfeeding has beneficial effects on respiratory infections while evidences about its protective effect on allergic disorders are unclear. During complementary feeding there is no evidence to avoid or encourage exposition to 'highly allergenic' foods to have modification of tolerance development. In children from birth to two years of age, Mediterranean diet has been associated with a lower risk of atopy, wheezing and asthma. Micronutrients, antioxidant and LCPUFA supplementation is not recommended and a whole food approach should be preferred, except for Vitamin D.

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## Background

Nutrition and dietary patterns are recognised as modifiable risk factors able to influence the respiratory disease development and progression as they can regulate the immune system. Therefore, nutrients can have a high impact on individual respiratory health and contribute to the development of the organism, and should not be considered only as an energy source.<sup>1</sup> Prenatal and early post-natal periods have a critical role in the individual outcome, as Barker affirmed: "Much of human development is completed during the first 1000 days after conception". The first 1000 days of life from conception to two years are considered critical in nutrition for enhancing short and long-term health outcomes. Early nutrition may influence the risk of developing *non-communicable diseases* (NCDs) later in life, including heart disease, hypertension, type 2 diabetes (T2DM) and chronic respiratory diseases (such as asthma) through epigenetic mechanisms.<sup>2</sup>

Furthermore, diet and nutrition may influence the development of the microbiota which may influence the immune, inflammatory and allergic mechanisms and thus can contribute to the development of many diseases.<sup>3</sup>

## Aim of the review

Currently, there is a lack of reviews amalgamating short and long-term effects of nutrition early in life on respiratory health. The aim of this paper is to discuss the current evidence regarding the short and long-term respiratory health effects of nutrients and dietary patterns during pregnancy, breastfeeding and complementary feeding and the potential underlying mechanisms.

## Methodology

### Eligibility criteria

The populations of interest were children from birth to 18 years and their mothers (during pregnancy and lactation). Inclusion criteria were: type of article (multicentre study, review, systematic review, observational study, case-control study, longitudinal/prospective study, retrospective study, randomised controlled trial), publication date (2011–2016), species (both human and animal), English language. Texts available only in abstract form were excluded.

### Information sources, search strategy and study selection

Publications were searched on MEDLINE® and Cochrane database inserting terms individually and using the Boolean ANDs and ORs. Other publications coming from the reference list of studies extracted from MEDLINE, Cochrane database and from the personal reference databases of the authors were also evaluated. In the search strategy the following terms were included: 'nutrients', 'micronutrients', 'LC-PUFA', 'Mediterranean Diet', 'human milk', 'complementary food', 'pregnancy', 'respiratory disease', 'pulmonary disease', 'asthma', 'epigenetics', 'first 1000 days', 'maternal diet' and 'respiratory health'.

All sources were retrieved between 01-09-2015 and 07-12-2016. The data screening and extraction were conducted

independently by two authors and any variances resolved between them.

## Maternal diet and respiratory health

Unhealthy lifestyle (alcohol, tobacco smoking, caffeine use, etc.) during pregnancy can influence foetus growth and development. Several studies showed that a correct lifestyle, even before pregnancy, can be effective for ensuring a healthy outcome for women and their babies.<sup>2</sup> Diet is one modifiable risk factor that women should be motivated to improve.<sup>4</sup>

### Maternal diet

Promoting healthy diet in childbearing age women should be a cornerstone of public health. The study of Mayor et al. has recently supported the crucial role of nutrition during pregnancy on health of offspring. Poor maternal nutrition influences placental development and foetal growth, resulting in low-birth-weight and enhanced risk of developing NCDs later in life.<sup>4</sup> However, the most interesting result of the study is that a maternal high-fat diet before and during pregnancy increases glucose and insulin levels and induces placental inflammation resulting in placental insufficiency, foetal growth restriction and alteration of foetal lung development. The impairment of foetal lung maturation may predispose to an increased risk of respiratory distress syndrome at birth and later of chronic lung disease. These results are important, first of all because the main dietary pattern of developed countries is characterised by a high consumption of saturated fats, red meats and poor intake of fresh fruits and vegetables, whole grain and seafood (the so-called Western diet).<sup>4</sup> This is an example of how maternal dietary habits can have long-term health consequences on infant.

The incidence of allergic diseases is increasing, both in developed and developing countries, concomitantly with the rise in living standards and the adoption of a 'Western lifestyle'. Studies highlight the first and second trimesters of pregnancy as critical periods for the development of allergic diseases, such as asthma.<sup>5</sup> Diets that are rich in fruit and vegetables, such as the Mediterranean diet (MD), have consistently been associated with a lower risk of allergic sensitisation (which is defined as a positive skin prick test to allergens) and allergic rhinitis in children in epidemiological studies, whereas a high maternal consumption of vegetable oils, margarine and processed foods has been associated with a higher risk of allergic sensitisation.<sup>5,6</sup> Mediterranean diet represents a balanced diet, characterised by frequent consumption of high amounts of fibres (whole cereals, legumes, vegetables, fruits and nuts), chemical compounds with anti-oxidative properties (flavonoids, phytosterols, vitamins), fish, unsaturated fatty acids (FAs) from olive oil and low intake of red meat.<sup>7</sup> Whole-grain foods are rich in bioactive compounds with anti-inflammatory properties, as well as vegetables and fruits. On the contrary, the consumption of red meat and foods with high glycaemic index may increase oxidative stress and chronic low-grade inflammation.<sup>8</sup> Therefore, the Mediterranean diet may constitute a promising approach to address inflammation-driven perturbation in gut microbiota, as present in allergic conditions. Indeed, it has been observed that high adherence to

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